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ISF External Interface Control Document Version 2.0

Peggy L Jester
Raytheon
NASA/GSFC Wallops Flight Facility
Wallops Island, Virginia 23337

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ICESat Contacts:

H. Jay Zwally, ICESat Project Scientist
NASA Goddard Space Flight Center
Greenbelt, Maryland 20771

Bob E. Schutz, GLAS Science Team Leader
University of Texas Center for Space Research
Austin, Texas 78759-5321

David W. Hancock III, Science Software Development Leader
NASA/GSFC Wallops Flight Facility
Wallops Island, Virginia 23337

Signature Page

Prepared by:

Peggy L. Jester, IOT Lead
Raytheon ITSS / Goddard Space Flight Center Wallops Flight Facility

Approved by:

Bob E. Schutz, GLAS Science Team Leader
University of Texas Center for SPace Research

Approved by:

David Hancock, GLAS Science Software Development Leader
Goddard Space Flight Center Wallops Flight Facility

Approved by:

Randal Davis, Director
Laboratory for Atmospheric and Space Physics, University of Colorado

Approved by:

Susan Borutzki, ICESat Mission Operations Manager
Ball Aerospace & Technologies Corporation

Approved by:

Michael Oben, Code 582 FSW IDIQ Sustaining Engineering
Goddard Space Flight Center

Approved by:

Kim Hawkins, GPS Sustaining Engineering
HAMRS, Goddard Space Flight Center

Approved by:

Ken Lehtonen, ICESat Operations Manager (Acting)
Goddard Space Flight Center

Foreword

This document was prepared by the Observational Science Branch at NASA GSFC/WFF, Wallops Island, VA, in support of Bob E. Schutz, GLAS Science Team Leader for the GLAS Investigation. This work was performed under the direction of David W. Hancock, III, who may be contacted at (757) 824-1238, hancock@osb.wff.nasa.gov (e-mail), or (757) 824-1036 (FAX).

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Section 1

Introduction

1.1 Identification of Document

This document is identified as the GLAS Instrument Support Facility's (ISF) External Interface Control Document.

1.2 Scope of Document

This document only discusses external interfaces that are pertinent to the ISF and its functions. When ISF external interfaces are described in other ICDs, those documents are referenced rather than including the description in this document.

1.3 Purpose and Objectives of Document

The purpose of this document is to define the ISF external interfaces, the data to be exchanged through the interfaces and the mechanism for exchange.

1.4 Document Status and Schedule

This document is being released as Version 1. Future updates will be released as needed.

1.5 Document Organization

This document's outline is assembled in a form similar to those presented in the NASA Software Engineering Program [Information Document 2.3a].

Section 2

Related Documentation

2.1 Parent Documents

a) ICESat Mission Operations Requirements Document, ICES-401-SPEC-002, NASA Goddard Space Flight Center.

2.2 Applicable Documents

a) ICESat Mission Operations Center External Interface Control Document, CDRL005c,BATC Document 545599, Ball Aerospace and Technologies Corp.

b) SAFS Naming and Project Interface Conventions, http://www.wff.nasa.gov/~websafs/safsintfc.pdf.

c) *Interface Control Document Between I-SIPS/ISF and CSR*, NASA Goddard Space Flight Center Wallops Flight Facility.

d) *Data Interface Control Document (ICD) Between the ICESat Spacecraft and the EOS Polar Ground Station (EPGS)*, BATC Document 545599, Ball Aerospace and Technologies Corp.

e) *GLAS Level 0 Instrument Data Product Specification*, Version 2.2, March 17, 1998, NASA Goddard Space Flight Center Wallops Flight Facility.

f) *GLAS Standard Data Products Specification - Level 1,* Version 6.0, October 2002, NASA Goddard Space Flight Center Wallops Flight Facility.

g) *GLAS Science Data Management Plan ,* NASA TM-1999-208641/Version 4.0/Volume 2, July 1999, NASA Goddard Space Flight Center Wallops Flight Facility.

h) *GLAS ISF File Transfer System Design Documentation,* Draft, June 2002, NASA Goddard Space Flight Center Wallops Flight Facility.

2.3 Information Documents

a) ICESAT Command and Telemetry Handbook, TBS.

Section 3

Interface Overview

This section shall provide an overview of the GLAS ISF external interfaces. The context diagram in Figure 3-1 "GLAS ISF Context Diagram" summarizes pictorially the

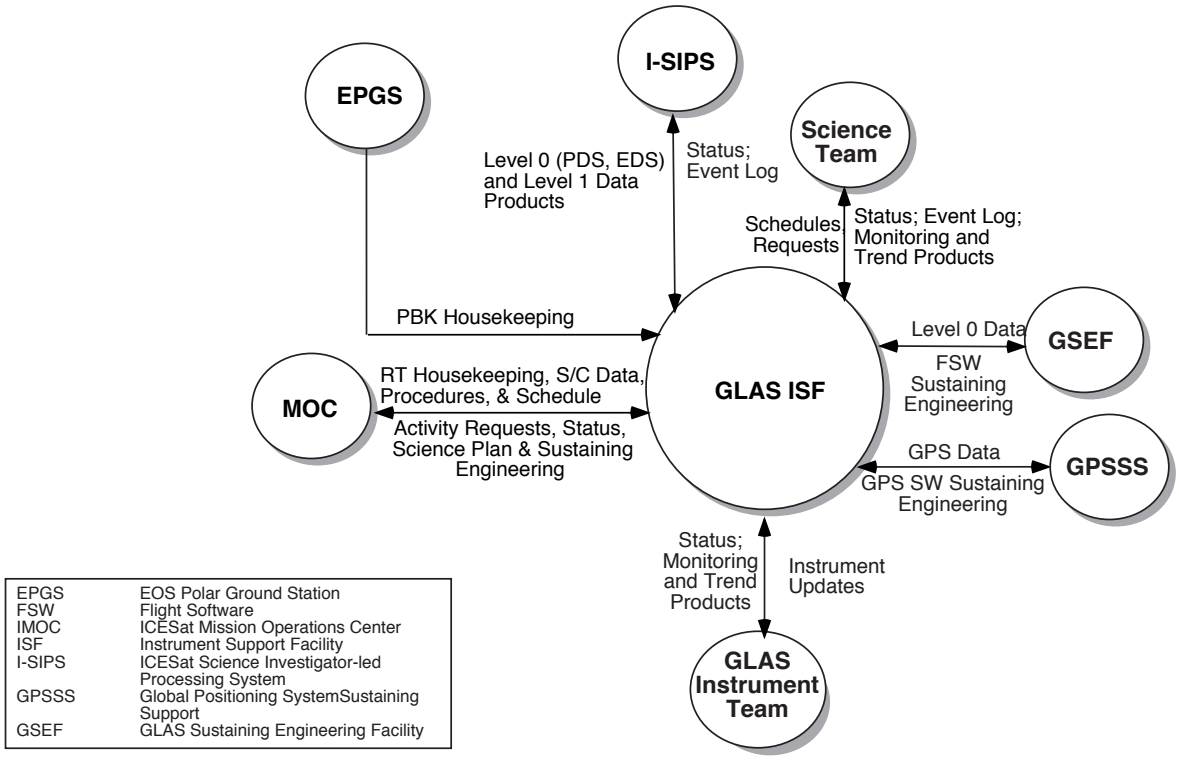

Figure 3-1 GLAS ISF Context Diagram

data flowing to and from the external interfaces. Each of the interfaces are briefly discussed in this section. Further details are contained in later sections of this document unless otherwise noted.

3.1 ICESat Mission Operations Center

The ICESat Mission Operations Center (MOC) provides real time instrument housekeeping data, spacecraft data and schedules, GLAS housekeeping data monitoring results, and command history data to the ISF. The ISF provides the MOC with GLAS activity requests, instrument plans, and instrument status. The GLAS activity requests include requests for instrument activities, spacecraft off-nadir point, for GLAS flight software uploads, and GPS Receiver sustaining engineering activities.

The details of the data to be exchanged and the method for the exchange is described in the MOC External ICD, Document 2.2a. The ICESat MOC is located at the University of Colorado's Laboratory for Atmospheric and Space Physics in Boulder, CO.

3.2 EOS Polar Ground Stations

The EOS Polar Ground Stations (EPGS) provides the ISF the playback housekeeping data via the Central Standard Autonomous File Server (CSAFS). The details of the playback housekeeping data flow are described in Document 2.2b. The EPGS are located at Alaska and Norway. Backup ground stations are at Wallops Flight Facility and McMurdo. The CSAFS is located at GSFC.

3.3 ICESat Science Investigator-led Processing System

The ISF will interface with the ICESat Science Investigator-led Processing System (I-SIPS) to receive Level 0 and Level 1 data products and associated quality and trend data. The ISF shall provide instrument status and history data to the I-SIPS. The ISF will provide event logs to the I-SIPS detailing spacecraft activities and maneuvers that may affect the GLAS performance. The I-SIPS is located at GSFC.

3.4 GLAS Science Team

The GLAS Science Team provides to the ISF schedules and requests for instrument activities such as targets of opportunity events. The schedules and requests are developed into activity requests for subsequent delivery to the MOC. The ISF provides the GLAS Science Team with instrument status and trend and monitoring products. The point of contact for the GLAS Science Team is Bob Schutz, the Science Team Leader, who is located at UT/CSR. *(Note: Is there additional data listed in the I-SIPS/ISF to UTCSR ICD? Or not in either that needs to be in one? need to decide how to handle.)*

3.5 GLAS Instrument Team

The ISF will provide the GLAS Instrument Team with instrument status, and monitoring and trend products. The GLAS Instrument Team will provide the ISF with requests to change the instrument configuration or mode (i.e., science, calibration, or diagnostic) and with requests to update the flight software. The requests may include commands to switch to redundant systems or to upload software parameters. The instrument team will use the monitoring and trend analysis products to determine the need for the updates. The ISF will provide any additional data and status information as requested by the instrument team. The GLAS Instrument Team is located at GSFC.

3.6 GLAS Sustaining Engineering Facility

The GLAS Sustaining Engineering Facility (GSEF) is the organization responsible for trouble-shooting and updating the GLAS Flight Software (GFSW). The GSEF is responsible for storing and maintaining the GFSW test bed. The GSEF will provide

the ISF with GFSW updates based on the GLAS Instrument Team requests. The ISF will provide the GSEF with data and status information as requested. The GSEF is located at GSFC.

3.7 GPS Sustaining Support

The GPS Sustaining Support (GPSSS) will provide sustaining engineering for the GPS receiver and its software. The GPSSS provides the ISF with GPS receiver commands and software updates. The ISF will provide the GPSSS with GPS data and status information as requested. The GPSS is located at the Jet Propulsion Laboratory (JPL) in Pasadena, CA.

Section 4

Data Exchange Framework

This section describes how data is to be exchanged between the ISF and its interfaces. This section divides the exchange framework into that controlled by the GLAS ISF and to that not controlled by the GLAS ISF. The Instrument Operations Team (IOT) is the group of people who work within the ISF to ensure that the ISF functions and responsibilities are fulfilled.

4.1 ISF-controlled Data Exchanges

The section is grouped by method of exchange. For each method of exchange the data to be exchanged, the receiving and source interfaces, and data availability are defined. The data is described in Section 5.

4.1.1 WWW

Data that is exchanged as web page displays or as files linked to web pages are defined in Table 4-1.

Table 4-1 Data to be Exchanged via WWW

Data	Receiving Interface	Source Interface	Availability
Instrument Status Reports	Science Team, Instrument Team, I-SIPS, MOC	ISF	Daily for previous 24 hours
Event Log File	Science Team, I-SIPS	ISF	Daily for previous 24 hours
Monitoring and Trend Products	Science Team, Instrument Team	ISF	Daily for previous 24 hours

4.1.2 E-mail

The E-mail address for the GLAS Instrument Operations Team (IOT) will be provided in a separate document.

4.1.2.1 Activity Requests

The GLAS Instrument Team, GSEF, and the GPSSS will send activity requests to the IOT at the ISF via E-mail. The activity requests are for instrument configuration changes, parameter updates, GLAS data and program dumps, GLAS software diagnostics, GLAS flight software loads, and GPS software loads.

4.1.2.2 Acknowledgements

The GLAS Science Team Leader shall send E-mail to the IOT acknowledging the receipt of the weekly TOO list and note any TOOs that are not acceptable.

E-mail notification will be sent from the ISF to the requestor acknowledging the receipt and successful/unsuccessful processing of instrument pointing requests, and instrument and GPS activity requests. The e-mails will be sent upon completion of the request processing.

E-mail notification will be sent to the requestor if for any reason a Target of Opportunity Request or command request is rejected by the ICESat MOC.

4.1.3 GLAS ISF FILE Transfer System

This section lists the files that will be exchanged via the GLAS ISF File Transfer System (FTS). Within the GLAS ISF FTS, each of the ISF external interfaces is defined as a project. Each project will push or pull data from the ISF FTS except where noted. The ISF will provide E-mail notification to projects that files are available. The design of the FTS is described in the *GLAS ISF File Transfer System Design Documentation* which is listed in Section 2. The projects defined in the ISF FTS are listed in Table 4-2 "ISF File Transfer System Projects". The data to be exchanged via the ISF FTS is listed in

Table 4-2 ISF File Transfer System Projects

External Interface	Project Name
ICESat Mission Operations Center	imoc
GLAS science team leader	gstl
GLAS science team	gsci
GLAS instrument engineering team	geng
GLAS Flight Software Sustaining Engineering Facility	gfsw
GPS Sustaining Support team	ggps
ICESat Science Investigator-led Processing System	isip
ISF / GLAS Instrument Operations Team (IOT)	giot

Table 4-3 "Data to be Exchanged via the ISF File Transfer System" with the source and receiving projects and the type of FTP transfer. The availability of instrument updates and requests is a guideline for normal operations. During times of critical activities or anomalies the ISF can handle deliveries within 24 hours of upload.

Table 4-3 Data to be Exchanged via the ISF File Transfer System

Data / File Type	Receiving Project	Source Project	FTP Transfer Type	Availability
Instrument Updates	giot	geng	source pushes	As needed, 2 weeks prior to upload
GFSW Sustaining Engineering Requests	giot	gfsw	source pushes	As needed, 2 weeks prior to upload

Table 4-3 Data to be Exchanged via the ISF File Transfer System (Continued)

Data / File Type	Receiving Project	Source Project	FTP Transfer Type	Availability
GPS Sustaining Engineering Requests	giot	ggps	source pushes	As needed, 2 weeks prior to upload
Upload Files for Flight Software Updates	giot	gfsw ggps	source pushes	As needed, 2 weeks prior to upload
Level 0 GLAS Data (EDS, PDS)	giot	isip	source pushes	Within 3 hours of receipt at the I-SIPS
Level 1 GLAS Data Products	giot	isip	source pushes	As generated
GLAS Time Constants File (ANC33)	isip	giot	source pushes	As updated
Event Log Data	isip	giot	receiving pulls	Daily for previous 24 hours
Monitoring and Trend Products	gsci geng	giot	receiving pulls	Daily
Instrument Level 0 Data	gfsw	giot	receiving pulls	Upon request
GPS Receiver Data	ggps	giot	receiving pulls	Upon request
Target of Opportunity Request	giot	gsci	source pushes	28 days prior to execution
Target of Opportunity Delete Request	giot	gsci	source pushes	As needed
Weekly TOO File	gstl	giot	receiving pulls	21 days prior to execution

Incoming data will be stored in the project's **in** directory on the glasist2.gsfc.nasa.gov computer within the ISF. Outgoing data will be stored in the project's **out** directory in Table 4-3. Each project will have one or more users. The procedures for accessing the ISF FTS is in Appendix B. The ISF FTS will automatically log that the file is available and will perform appropriate processing which may include executing programs, moving the files, and sending e-mail notifications to other projects. Each file type delivered by the projects will have a set of processing rules. Section 5 defines the required format of each file type.

4.2 Externally-controlled Data Exchanges

This section is grouped by the controlling organization. Listed here are the data to be exchanged, the receiving and the source interfaces, and the data availability. The method of exchange and the data descriptions are defined in the referenced documents.

4.2.1 MOC

The MOC External ICD defines the data exchange framework and the data format for the data exchanged between the ISF and the MOC**.** The data is listed in Table 4-4 "Data to be Exchanged with the MOC" on page 4-4

Table 4-4 Data to be Exchanged with the MOC

Data	Receiving Interface	Source Interface	Availability
Real-time Housekeeping Data	ISF	MOC	upon receipt from the ground network
Archived Housekeeping Data	ISF	MOC	As needed
Target of Opportunity Requests	MOC	ISF	14 days prior to execution
Target of Opportunity Deletion	MOC	ISF	as needed
Target of Opportunity Rejection	ISF	MOC	4 days prior to execution
Flight software / GPS Receiver/ SRS/ SIRU Uploads and Procedures (ICESat Activity Change Requests (IACRs))	MOC	ISF	7 days prior to execution
Contact Schedule	ISF	MOC	upon receipt from WOTIS
Integrated Timeline (long-range and daily)	ISF	MOC	updated daily
Spacecraft Command History	ISF	MOC	daily after 1200Z
Maneuver Plan	ISF	MOC	1 week prior to maneuver
Quaternion File	ISF	MOC	daily after 2200Z
Basetime Update File	ISF	MOC	within 1 orbit of update
Orbit Numbers File	ISF	MOC	weekly

4.2.2 GN/CSAFS

The GN/CSAFS to ISF data exchange framework for the playback housekeeping data, see Table 4-5 "Data to be Exchanged with the GN/CSAFS" on page 4-5, is described in Document 2.2b. The GLAS housekeeping packets are defined in Document 2.2d.

Table 4-5 Data to be Exchanged with the GN/CSAFS

Data	Receiving Interface	Source Interface	Availability
Playback Housekeeping Data	ISF	GN/CSAFS	Within 3 hours of playback

Section 5

Data Description

This section shall describe the ISF external interface data. The external interface data is data exchanged between the ISF and its external interfaces. For data described in other documents those documents will be referenced. Table 5-1 "GLAS ISF External Interface Data" lists the data to be exchanged and it's source and destination.

Table 5-1 GLAS ISF External Interface Data

Data	Source	Destination
GLAS PBK Housekeeping Packets	GN/CSAFS	ISF
GLAS RT Housekeeping Packets Archived Housekeeping Data Contact Schedule Integrated Timelines Spacecraft Command History Maneuver Plan Quaternion File Basetime Update File Orbit Numbers File Target of Opportunity Rejection	MOC	ISF
GLAS Target of Opportunity Requests/Deletions Sustaining Engineering Uploads/Procedures (IACRs)	ISF	MOC
Instrument Operations Schedule Instrument Monitoring and Trend Products Event Log Data	ISF	ST, IT, I-SIPS
Instrument Status Reports	ISF	ST, IT, I-SIPS, MOC
Science Team Requests/Schedules	ST	ISF
GPS Receiver Commands/Flight Software Sustaining Engineering Requests and Uploads	GPSSS	ISF
GLAS Flight Software Sustaining Engineering Requests and Uploads	GSEF	ISF
GLAS Instrument Sustaining Engineering Requests	IT	ISF
Level 0 and Level 1 Data Products Frequency board to GPS time correlation file (ANC32)	I-SIPS	ISF
GLAS ISF/GLAS ISIPS Interface file (ANC33)	ISF	I-SIPS
GLAS and GPS Data	ISF	ST, IT, GSEF, GPSSS

5.1 Data Provided by the Ground Network

The playback housekeeping packets are received at the ISF from the GN at 262 kbps through CSAFS. The packets are those spacecraft, GPS, and instrument packets that are transmitted from the ICESat observatory to the ground stations via the s-band link. Table 5-2 "GLAS S-Band Packets" lists the GLAS Housekeeping packets and their Application Process Identifier (APID), size, and rate. The official packet descriptions and formats are contained in Document 2.2d.

Table 5-2 GLAS S-Band Packets

Packet Name	APID	Size	Rate
CT HW Tlm #1	20	56	0.25
CT HW Tlm #2	21	56	0.25
CT HW Tlm #3	22	56	0.0625
CT HW Tlm #4	23	56	0.0625
Small Software Tlm #1	24	56	0.25
Large Software Tlm #1	25	300	0.25
CT HW Tlm #5	50	56	0.03125
Large Software Tlm #2	55	376	0.25
DSP Code Memory Dump	31	828	On command
DSP Data Memory Dump	32	828	On command
C&T Dwell Packet	33	336	On command
Memory Dwell Packet #1	27	212	On command
Memory Dwell Packet #2	28	212	On command
Event Message	34	80	On command
Memory Dump	35	224	On command
Table Dump	36	224	On command
Etalon Calibration	37	2076	On command
GLAS Data Types Packet	48	72	On command

5.2 Data Provided by the IMOC

The data provided by the IMOC is described in the ICESat MOC External ICD, document 2.2a.

5.3 Data Generated at the ISF

5.3.1 GLAS Targets of Opportunity Requests/Deletions

GLAS Targets of Opportunity (TOO) Requests contain the requests for pointing the spacecraft at special targets and for performing the ocean scans. The requests are generated weekly and span at least 1 week of instrument operations. Emergency requests can be generated when needed. The requests are ASCII files and the format is defined in the ICESat MOC External ICD.

GLAS TOO Deletions contain requests to delete previously submitted TOO requests. The science team or Instrument Operations Team (IOT) may wish to delete requests to resolve conflicts with other requests or observatory activities. The requests are ASCII files and the format is defined in the ICESat MOC External ICD.

5.3.2 GLAS TOO Weekly Files

The collection of the TOO Requests for a week will be provided to the GLAS Science Team Leader for his concurrence prior to submitting the TOO Request to the ICESat MOC. The GLAS Science Team Leader shall provide feedback through E-mail to the IOT at the ISF noting any TOOs that are not acceptable.

5.3.3 Instrument Status Reports

The GLAS Instrument Status Reports will be released daily and are generated based on the previous 24 hours of instrument data. The status reports include statistics for key monitoring values, status of the instrument including current configuration, events occurring during previous 24 hours, and upcoming events. The status report will be posted to the GLAS Instrument mission operations web page. A text version of the report will be archived at the ISF. An example of the report is in Appendix A.

5.3.4 Instrument Operations Schedule

The instrument operations schedule lists events and their planned time/date of execution. Spacecraft events are included when they are applicable to the instrument. Included in the schedule are important meeting dates. The schedule is a list of events and their planned execution time. The schedule will be posted to the GLAS Instrument mission operations web page and will be updated weekly.

5.3.5 Instrument Monitoring and Trend Products

The monitoring and trend products are plots, statistics, and reports that are posted to the GLAS Instrument mission operations web page. The monitoring products are generated and posted daily. The trend products are appended to daily. The products are generated from the GLAS housekeeping data and the Level 0 and 1 data products. The products are also available via FTP through the GLAS ISF FTS. Detailed contents of the monitoring and trend products are TBD.

5.3.6 Event Log File

This file contains a history of all GLAS instrument events and key spacecraft events. Events include instrument command uplinks and executions. The log file is a text file

that will be accessible from the GLAS Instrument mission operations web page. The log will be appended to daily. The log file data will be provided to the I-SIPS for use in data processing. The log file format is ASCII, tab separated data. The contents of the file are UTC time of event, command type, command mnemonic, and command description. The event log will also be transferred to the I-SIPS via FTP through the GLAS ISF FTS.

5.3.7 GLAS and GPS Data

As requested GLAS Level 0 data, and spacecraft data (including status) will be provided to the Instrument Team and the GSEF for flight software troubleshooting and verification of memory loads. GPS data will be provided to the GPSSS for receiver software troubleshooting and testing as requested. The packet formats are provided in document 2.2d listed in Section 2. The GLAS and GPS data will be transferred via FTP through the GLAS ISF FTS.

5.3.7.1 GLAS Dump Packets

The GLAS dump packets (APIDs 31, 32, 35, 36) are converted to ASCII, Hexadecimal files and are provided to the GSEF for verification of memory, data, and table loads. When the instrument loads and subsequent dumps are performed, these packets will be requested to be expedited.

5.3.7.2 GLAS Memory Dwell Packets

The GLAS Memory Dwell packets (APIDs 27 and 28) will be used during GLAS flight software loads to verify a load is successful and during anomalies for troubleshooting. The memory dwell packet data will be displayed at the ISF during the load either from the real time or playback data. The packets will be made available to the GSEF.

5.3.7.3 Position, Rate and Attitude Packet

The Position, Rate, and Attitude Packet (PRAP - APID 1984) will be provided to the SRS sustaining engineering or GLAS instrument team upon request. The PRAP will be provided in its raw binary format.

5.3.7.4 GPS Data

The GPS receiver packet (APID 1088) will be provided to the GPS sustaining engineering team upon request. The GPS packet will be provided in its raw binary format.

5.3.8 GLAS ISF/GLAS ISIPS Interface file (ANC33)

The GLAS ISF / GLAS ISIPS Interface file provides the ISIPS the instrument state, the jammed spacecraft and GLAS times, spacecraft and GLAS oscillator frequencies, and the LRS tracker configuration. Each time one of the items in the file is updated, a new record is added with the new information. The new record shall also be time tagged with the UTC time of when the data in the record is valid; the data in the record should be used from the UTC time tag of the record until a new record is added to the file. For those values that did not change the previous values are used. The record

format of the file is shown in Table 5-3 "Record Format of the GLAS ISF / GLAS ISIPS Interface File".

Table 5-3 Record Format of the GLAS ISF / GLAS ISIPS Interface File

Data Type (Number of Bytes)	Description
Double Precision (8)	Jammed GLAS MET (mission elapsed time)
Double Precision (8)	Jammed Spacecraft VTCW
Double Precision (8)	UTC time of jammed values
Double Precision (8)	GLAS Oscillator Rate
Double Precision (8)	Spacecraft Oscillator Rate
Double Precision (8)	Time delay in the Altimeter Digitizer (AD)
Double Precision (8)	Range delay in the AD
Double Precision (8)	Time Bias of the AD time delay (determined post-launch)
Double Precision (8)	Range Bias of the AD range delay (determined post-launch)
Integer (4)	Subject indicator for LRS Tracker 0; 0= Star Data, 1= Laser Data, 2= Collimated Data.
Integer (4)	Subject indicator for LRS Tracker 1; 0= Star Data, 1= Laser Data, 2= Collimated Data.
Integer (4)	Subject indicator for LRS Tracker 2; 0= Star Data, 1= Laser Data, 2= Collimated Data.
Integer (4)	Instrument state; described in Appendix C.
Double Precision (8)	The UTC time when the data in this record is valid.

5.4 Data Generated by the Science Team

5.4.1 Target of Opportunity Request

The science team will submit requests for targets of opportunity through the GLAS ISF FTS. The target of opportunity request is an ASCII keyword = value file. The required keyword = value combinations are listed in Table 5-4 "Keywords for TOOR" on page 5-6.

The file naming convention for the TOO request is

gtoor_nnnnn_rid.req

where nnnnn = 5 digit orbit number of the first orbit in the request and
rid is the 2 character requestor id assigned by the IOT.

Multiple requests in one file must be separated by a line with an exclamation point in the first position.

Table 5-4 Keywords for TOOR

Keyword	Values
TYPE	PATH,POINT,SCAN
PURPOSE	brief description of target; single line <= 80 characters
ORBIT	user selected orbit number for TOO
START_TIME	Estimated start time of TOO; format = YYY/DDD-HH:MM
LAT1	Latitude of point target or Start latitude of path target; not required for SCAN
LON1	Longitude of point target or Start longitude of path target; not required for SCAN
LAT2	Stop latitude of path target; not required for PATH or SCAN
LON2	Stop longitude of path target; not required for PATH or SCAN
ANGLE	3 or 5; ocean scan angle; not required for POINT or PATH
REQUESTOR	TOO requestor
REQUEST_DATE	Date TOO request generated

5.4.2 Target of Opportunity Deletion

The science team can send requests to delete a previously submitted TOO request through the GLAS ISF FTS. The format of the deletion request is the same as the TOO request (Table 5-4).

The file naming convention for the TOO deletion is

gtood_nnnnn_rid.del

where nnnnn = 5 digit orbit number of the first orbit containing a TOO to delete and
rid is the 2 character requestor id assigned by the IOT.

Multiple deletions in one file must be separated by a line with an exclamation point in the first position.

5.5 Data Generated by the Instrument Team

The instrument team will send requests for updates to the instrument configuration via e-mail to the IOT at the ISF. Instrument configuration updates include switching to redundant systems (i.e. from LASER 1 to LASER 2), switching operating modes, or updating flight software parameters. The request shall include the requested update and any constraints. Supporting data will be provided in files delivered trough the GLAS ISF FTS.

5.6 Data Generated at the I-SIPS

5.6.1 Level 0 and Level 1 Data Products

The Level 0 and Level 1 data products will be provided from the I-SIPS through the GLAS ISF FTS. The data products will include associated quality and trend data. These products will be used at the ISF to generate the monitoring and trend products for the GLAS science data. The Level 0 data product is described in document 2.2e, the Level 0 Instrument Data Specification; The Level 1 data product is described in document 2.2f, the Level Data Product Specification.

5.6.2 Frequency Board to GPS Time Correlation File (ANC32)

The ANC32 GPS file provides timing data based on the last update of the onboard GPS. It contains records which identify each time the GPS clock is updated within the APID packets. ANC32 is a binary, fixed-length record file. The record format is described in Table 5-5 "Record Format of the Frequency Board to GPS Time Correlation File".

Table 5-5 Record Format of the Frequency Board to GPS Time Correlation File

Data type (number of bytes)	Description
Integer (4)	Record index where GPS was updated.
Integer (4)	shot counter value when GLAS received spacecraft's time and position packet.
Double precision (8)	UTC Time of when GPS time changed.
Double precision (8)	Frequency and time board counter value latched to GPS tick.
Double precision (8)	GLAS MET value when GLAS received spacecraft's time and position packet.
Double precision (8)	Spacecraft VTCW latched to the GPS tick.
Double precision (8)	The GPS time of the GPS tick.
Double precision (8)	GLAS MET latched to the GPS tick.

5.7 Data Generated by the GSEF

The GSEF will send an E-mail requesting a GLAS flight software load to the IOT at the ISF. The GSEF will provide the load and procedures through the GLAS ISF FTS. The updates will include the commands and data to load and the procedure to load and verify the load. The file naming convention for the load files requires the first 6 characters to be **gswlf_**. The load files will be the ASCII DSP, IPS, or table load CCSDS commands. The procedures will be ASCII files outlining the flight procedures required to load flight software and to verify the successful completion of the load. The file naming convention for the procedures requires the first 6 characters to be **gswprc**.

5.8 Data Generated by the GPSSS

The GPSSS will send an E-mail requesting a GPS flight software load or update to the IOT at the ISF. The GPS receiver commands and flight software updates will be received from the GPSSS through the GLAS ISF FTS. The file naming convention for the load files requires the first 6 characters to be **gpslf_**. The files will be in the binary TurboRogue Space Receiver (TRSR) image packets. The file will include the initial upload command indicating whether it is a TBPROM or RCVM load.

Appendix A
Daily Status Report Format

GLAS Daily Status Report

YYDOY: 02115

Current configuration: laser 3, det 2, dig 2

Transmit Pulse Statistics:

	Tx Peak (counts)	Tx Peak Location (nanoseconds)	Tx Full Width Half max (counts)	532 Energy (femtojoules)
Max	162.00	186512.00	8.00	23.00
Min	125.00	185268.00	5.00	0.00
Mean	144.30	185905.92	6.36	0.15
Std Dev	3.91	189.64	0.49	1.62

Echo WF Statistics:

	Echo Peak (counts)	Echo Peak Location (nanoseconds)
Max	115.00	3987708.00
Min	30.00	3985868.00
Mean	90.61	3986645.50
Std Dev	14.19	323.52

Filter Statistics

	4	**8**	**16**	**32**	**64**	**128**
Num Pts	1075.00	0	292	0	0	0
Max	28.89	0	28.87	0	0	0
Min	28.63	0	28.69	0	0	0
Mean	28.79	0	28.79	0	0	0
Std Dev	0.04	0	0.03	0	0	0

Noise Statistics:

	4ns Mean	4ns Std Dev	Std Dev from echo pulse
Max	28.89	0.83	2.18
Min	28.63	0.75	0.44
Mean	28.79	0.79	0.81
Std Dev	0.04	0.01	0.17

Return Gain Setting:

AutoGain: No

Mean: 41.00

StDv: 0.00

Number of Return Pulses 1367

Photon Counter Background Data:

	BG1	BG 2
Max	3	5
Min	0	0
Mean	1.5	2.2
Std Dev	.75	1.5

Cloud Digitizer Data: :

	BG1	BG 2
Max	3	5
Min	0	0
Mean	1.5	2.2
Std Dev	.75	1.5

Flight Software Status:

All Flight software parameters are nominal.

Appendix B
Procedure for Transferring Files to the ISF via FTS

Note: Each computer command is prefaced by =>. Text in italics should be entered at a computer prompt exactly as it appears in this appendix. Non-italicized text within a computer command should be replaced with user-specific information. Complete each computer command with a carriage return.

B.1 Source Project File Transfer to the GLAS ISF

1) FTP to the appropriate workstation within the GLAS ISF, using the project's userid and password:

   =>ftp glasist2.gsfc.nasa.gov

2) Change to the "in" data directory:

   =>cd in

3) Set the transfer format to binary:

   =>bin

4) Put the desired file(s) on the GLAS ISF (assumes user is in correct directory on the source machine):

   =>put filename

5) Upon completion of file transfer(s), exit out of ftp session:

   =>quit

B.2 Source Project File Transfer from the GLAS ISF

1) FTP to the appropriate workstation within the GLAS ISF, using the project's userid and password:

   =>ftp glasist2.gsfc.nasa.gov

2) Change to the "out" data directory:

   =>cd out

3) Set the transfer format to binary:

   =>bin

4) Retrieve the desired file(s) from the GLAS ISF (assumes user is in correct directory on the destination machine):

   =>get filename

5) Upon completion of file transfer(s), exit out of ftp session:

   =>quit

Appendix C

Description of the GLAS Instrument State Flag

Name - Instrument state

Description – Flag describing the hardware state of the instrument; indicates which one of redundant subsystems are operating or enabled. This flag is created by the L1A subsystem's L_Eng process. The flag is stored in the GLAS Level 1 and Level 2 product headers.

Detailed description –

Bit 0:0 = laser A is disabled; 1 = laser A is enabled (from APID 20)

Bit 1:0 = laser B is disabled; 1 = laser B is enabled (from APID 20)

Bit 2:0 = laser C is disabled; 1 = laser B is enabled (from APID 20)

Bit 3:0 = OTS is disabled; 1 = OTS is enabled (from APID 20)

Bit 4:0 = Primary Altimeter Digitizer is disabled; 1 = Primary Altimeter Digitizer is enabled (from APID 21)

Bit 5:0 = Secondary Altimeter Digitizer is disabled; 1 = Secondary Altimeter Digitizer is enabled (from APID 21)

Bit 6:0 = Primary Oscillator is disabled; 1 = Primary Oscillator is enabled (from APID 21)

Bit 7:0 = Secondary Oscillator is disabled; 1 = Secondary Oscillator is enabled (from APID 21)

Bit 8:0 = SPCM 1 is disabled; 1 = SPCM 1 is enabled(from APID 55)

Bit 9:0 = SPCM 2 is disabled; 1 = SPCM 2 is enabled(from APID 55)

Bit 10:0 = SPCM 3 is disabled; 1 = SPCM 3 is enabled(from APID 55)

Bit 11:0 = SPCM 4 is disabled; 1 = SPCM 4 is enabled(from APID 55)

Bit 12:0 = SPCM 5 is disabled; 1 = SPCM 5 is enabled(from APID 55)

Bit 13:0 = SPCM 6 is disabled; 1 = SPCM 6 is enabled(from APID 55)

Bit 14:0 = SPCM 7 is disabled; 1 = SPCM 7 is enabled(from APID 55)

Bit 15:0 = SPCM 8 is disabled; 1 = SPCM 8 is enabled(from APID 55)

Bit 16:0 = GPS Receiver 1 off; 1 = GPS Receiver 1 on (from APID 24)

Bit 17:0 = GPS Receiver 2 off; 1 = GPS Receiver 2 on (from APID 24)

Bit 18:0 = Primary Altimeter Detector is disabled; 1 = Primary Altimeter Detector is enabled (from APID 20 – if Primary Altimeter Detector 550V = 550V then Primary Detector is enabled)

Bit 19:0 = Secondary Altimeter Detector is disabled; 1 = Secondary Altimeter Detector is enabled (from APID 20 – if Secondary Altimeter Detector 550V = 550V then Secondary Detector is enabled))

Bits 20-31:spares

Abbreviations & Acronyms

APID	Application Process IDentifier
EDOS	EOS Data and Operations System
EOS	NASA Earth Observing System Mission Program
EOSDIS	Earth Observing System Data and Information System
EPGS	EOS Polar Ground Stations
GFSW	GLAS Flight Software
GLAS	Geoscience Laser Altimeter System instrument or investigation
GPS	Global Positioning System
GPSSS	GPS Sustaining Support
GSEF	GLAS Sustaining Engineering Facility
GSFC	NASA Goddard Space Flight Center at Greenbelt, Maryland
GSFC/WFF	NASA Goddard Space Flight Center/Wallops Flight Facility at Wallops Island, Virginia
ID	Identification
IOT	GLAS Instrument Operations Team
I-SIPS	Icesat Science Investigator-led Processing System
ISF	GLAS Instrument Support Facility
IST	GLAS Instrument Support Terminal
JPL	Jet Propulsion Laboratory
LASER	Light Amplification by Stimulated Emission of Radiation
LASP	Laboratory for Atmospheric and Space Physics
LIDAR	Light Detection and Ranging
MOC	Mission Operations Center
N/A	Not (/) Applicable
NASA	National Aeronautics and Space Administration
TBD	to be determined, to be done, or to be developed
UNIX	the operating system jointly developed by the AT&T Bell Laboratories and the University of California-Berkeley System Division
UT/CSR	University of Texas Center for Space Research

Glossary

Level 0	The level designation applied to an EOS data product that consists of raw instrument data, recorded at the original resolution, in time order, with any duplicate or redundant data packets removed.
Level 1A	The level designation applied to an EOS data product that consists of reconstructed, unprocessed Level 0 instrument data, recorded at the full resolution with time referenced data records, in time order. The data are annotated with ancillary information including radiometric and geometric calibration coefficients, and georeferencing parameter data (i.e., ephemeris data). The included, computed coefficients and parameter data have not however been applied to correct the Level 0 instrument data contents.
Level 1B	The level designation applied to an EOS data product that consists of Level 1A data that have been radiometrically corrected, processed from raw data into sensor data units, and have been geolocated according to applied georeferencing data.
Level 2	The level designation applied to an EOS data product that consists of derived geophysical data values, recorded at the same resolution, time order, and georeference location as the Level 1A or Level 1B data.
Level 3	The level designation applied to an EOS data product that consists of geophysical data values derived from Level 1 or Level 2 data, recorded at a temporally or spatially resampled resolution.
Level 4	The level designation applied to an EOS data product that consists of data from modeled output or resultant analysis of lower level data that are not directly derived by the GLAS instrument and supplemental sensors.
orbit	The passage of time and spacecraft travel signifying a complete journey around a celestial or terrestrial body. For GLAS and the EOS ALT-L spacecraft each orbit starts at the time when the spacecraft is on the equator traveling toward the North Pole, continues through the equator crossing as the spacecraft ground track moves toward the South Pole, and terminates when the spacecraft has reached the equator moving northward from the South Polar region.
pass	A sub-segment of an orbit, it may consist of the ascending or descending portion of an orbit (e.g., a descending pass would consist of the ground track segment beginning with the northernmost point of travel through the following southernmost point of travel), or the segment above or below the equator; for GLAS the pass is identified as either the northern or southern hemisphere portion of the ground track on any orbit
Standard Data Product	Specifically, a GLAS Standard Data Product. It represents an EOS ALT-L/ GLAS Data Product produced on the EOSDIS SDPS for GLAS data product generation or within the GLAS Science Computing Facility using EOS science community approved algorithms. It is routinely produced and is intended to be archived in the EOSDIS data repository for EOS user community-wide access and retrieval.

Shared Items
Graphics
ISF Interfaces.eps 3-1
Graphics
icesat.gif @ 150 dpi 1
CoverPage (DocDate
September 4, 1995) iii–GL-2
CoverPage (DocTitle
Document Title) iv, vi, viii, x, 1-2, 2-2, 3-2–3-4, 4-2–4-4, 5-2–5-6, AB-2, GL-2
CoverPage (DocVersion
Document Version) iii–GL-2
Helvetica @ 10.0 pt 2–GL-2
Helvetica @ 12.0 pt v
Helvetica @ 14.0 pt 1
Helvetica-Bold @ 10.0 pt 1, 1-1, 2-1, 3-1, 4-1–4-3, 5-1–5-2
Helvetica-Bold @ 12.0 pt 1, 4-1–4-3, 5-3–5-4
Helvetica-Bold @ 14.0 pt 1–2, v, 1-1, 2-1, 3-1–3-3, 4-1–4-2, 5-1–5-5
Helvetica-Bold @ 18.0 pt 1, iii, v, vii, ix, 1-1, 2-1, 3-1, 4-1, 5-1, AB-1, GL-1
Helvetica-BoldOblique @ 10.0 pt 1
Helvetica-BoldOblique @ 12.0 pt 1
Helvetica-Oblique @ 10.0 pt 4-3
NewCenturySchlbk-Roman @ 12.0 pt v
Palatino-Bold @ 12.0 pt 4-2
Palatino-Italic @ 12.0 pt 2-1, 3-1–3-2, 5-3, 5-5
Palatino-Roman @ 12.0 pt 1, iii, vii, ix, 1-1, 2-1, 3-1–3-3, 4-1–4-3, 5-1–5-5, GL-2
Times-Roman @ 12.0 pt AB-1, 3